The Newsletter of the International Fission-Track Community
July 1999, Volume 9, Number 1, Issue 18

Editor: *Alexander Grist*
Fission Track Research Laboratory,
Department of Earth Sciences,
Dalhousie University, Halifax, Nova Scotia, Canada B3H 3J5
(agrist@is.dal.ca)

In this Issue:

One copy per lab; please copy and distribute

On Track is a biannual newsletter of the international fission-track community. It is (not usually) printed in the months of May and November. The views expressed in On Track are those of the authors and do not necessarily reflect those of the fission-track community or the editor(s) of On Track.

On Track will remain free, at least for the near future. However, to save costs we generally mail only one copy per lab so please be sure to pass On Track around your lab.

Printing and mailing costs for this issue of On Track were paid for by paid advertisements. Standard prices for full, half, and quarter page advertisements are US$ 200, US$ 100 and US$ 50, respectively. There is no charge for "short" ads by non-commercial entities (e.g., universities). Send inquiries concerning On Track to the editor.

PREVIOUS EDITORS:
Dave Coyle (1990-91), La Trobe University
Trevor Dumitru (1991-92), Stanford University
Rasoul Sorkhabi (1992-93)Arizona State University
Dennis Arne (1993-94) Dalhousie University
Richard J. Weiland (1994-95) U of Texas, Austin
Ruth Siddall (1995-96) University College London
Danny Stockli (1996-97) Stanford University
Paul O'Sullivan (1997-98) La Trobe University

CURRENT EDITOR:
Alexander Grist
Department of Earth Sciences
Dalhousie Universtiy
Halifax, Nova Scotia
Canada B3H 3J5
Tel. (902) 494-2372
Fax. (902) 494-6889
E-mail: agrist@is.dal.ca

Editor's Notes

My how time flies! I am finally getting comfortable using MSWord, and here it is already the end of my term as the editor of ***On Track***. Oh well, maybe I'll write my dissertation is in MSWord (and Bill Gates keeps on getting richer). It has been a pleasure communicating back and forth with so many people in the fission track community, and I will miss that part of wearing the editor's hat the most.

In this issue of On Track: **Paul O'Sullivan and Asaf Raza** get back to the basics of zircon FT dating with the application of the method to the study of early hominid sites. There is a special announcement 31st International Geological Congress in Rio de Janeiro, August 6-17, 2000 by **Gérard Poupeau**. Gérard also tells us about his new book: Man, obsidian, fission tracks and archaeology in the Near- and Middle-Orient (Do I detect a kind of an archaeological theme developing here?). **Barry Kohn** provides an update on the 9th International Conference on Fission Track Dating and Thermochronology at Lorne, Australia. And finally I (as my alter ego) offer a tip on improving the purity of apatite separates.

I would like to thank **Ray Donelick** of Donelick Analytical, **Trevor Dumitru** of FT STAge Systems, and **Mike Krochmal** of Autoscan Systems, who by ordering advertisements have permitted the continued free distribution of On Track. As in the previous issue, I would also like to thank **Marcos Zentilli**, who allowed me to work on On Track, and has thereby also subsidized production costs.

Finally, it is my pleasure now to introduce the next editor of On Track, **Richard Spikings**, from ETH-Zürich, the Swiss Federal Institute of Technology. Richard graduated from St. Andrews University, Scotland, in 1993 with a BSc. (hons) degree in Geochemistry. Fortunately, the Scottish system allots sufficient undergraduate curriculum time to research so that useful projects can be completed and Richard used the opportunity to map several carbonatitic remnants in central Namibia. Additionally, an ICP-MS analysis, studying REE partitioning, exposed some interesting aspects of the affects of alkaline metasomatism within carbonate rich crystalline rocks. His academic career then temporarily halted while he spent one year in the ranks as an infantry officer in Northern Ireland.

Richard's next academic appointment took him to La Trobe University, Melbourne, Australia to work as part of the thermochronology group commanded by Andy Gleadow. His research focused on determining the post-orogenic thermal and tectonic histories of the Palaeoproterozoic Mt. Isa and Georgetown inliers in northeastern Australia. 40Ar/39Ar and apatite FT thermochronology revealed various super-continent connections within the Australian Shield and he completed his Ph.D. in 1998. Smaller projects that Richard became involved with during his time at La Trobe included FT work along the eastern margin of Selawesi with the Indonesian Geological Survey and a small scale FT survey within Namibia with Prof. Peter Bowden. Since then, Richard has been based with the FT group at ETH-Zürich, Switzerland, led by Diane Seward. His main field of research at the ETH involves a detailed multi-phase 40Ar/39Ar and FT study within the Cretaceous eastern Cordillera of the Ecuadorian Andes (with Diane Seward, Wilfried

Winkler and Jean-Pierre Burg). Richard is investigating the relationship between the timing of Andean orogenic growth and the kinematics of the subducting slab, as well as the simultaneous development of the retro-foreland basin. The project will continue for at least two more years and will expand northwards into the Colombian Andes in order to more tightly define the relationship between the formation of the Caribbean and the northern Andean sector. Other FT projects at ETH that Richard is involved with include the laboratory synthesis of apatite phases and their respective annealing kinetics, and geological investigations into the growth of the northern calcareous alps.

Please send all your future On Track submissions and news items to Richard's e-mail address: **Spikings@erdw.ethz.ch**.

Short Tracks: News

The following news items appeared magically in my e-mail box in the last few months. **John Garver** wrote to say that the FT lab at Union College in Schenectady, New York, has a new home (the F.W. Olin Center) a building that was designed, in part, for particle track studies at Union. The facilities include an FT counting room and an Alpha-track counting room in the main office complex, a mineral separation room in the basement, and a particle track lab which serves as the primary lab space for all particle track sample preparation, including annealing and etching (shared with **R. L. Fleischer**, who is currently working on Alpha tracks from radon preserved in eyeglasses). The new space is a vast improvement over the previous cramped quarters.

Raymond A. Donelick wrote to say that **Margaret B. Donelick** joined his company (Donelick Analytical, Inc.) as Vice-President several years ago after leaving Amoco Corporation and has been appointed Affiliated Assistant Professor at the University of Idaho (UI). Ray maintains his Adjunct Professorship at Rice University and is also an Affiliated Assistant Professor at UI. The company has also moved and is now located in Viola, Idaho (Ed: for the complete address, see ad in this issue).

Ana-Voica Bojar wrote to inform us that her lab at Karl-Franzens University in Graz, Austria, has just installed a new Fission Track stage from Trevor Dumitru, and that it works nicely (Ed.: Can I charge Trevor for this plug?)

Mike Hulver (Ph.D. Dissertation: Hulver, Michael L., 1997. Post-orogenic evolution of the Appalachian Mountain System and its Foreland. The University of Chicago, 1055 pages) wrote to inform us that in mid-December he left Argonne National Laboratory in the cold Chicago suburbs and moved to Saudi Arabia, to look for oil and gas with Saudi Aramco in Dhahran. He has been given, at least partially, the task of running a Regional Paleozoic Tectonic and Stratigraphy Project, and within a couple of months has gotten out into the field more than he had in the previous 5 years, looking at Paleozoic sandstones in the southwestern corner of the country. He is currently reviewing some FT work that GEOTRACK did for Aramco in the early '90s, to see if it is worth while to do some more. He and his family are settling in nicely, and he hopes to make it to the Lorne FT conference (Ed.: Don't we all!).

Johan De Grave wrote to introduce himself to the FT community and inform us that he has started a Ph.D. project in fission tracks at the University of Gent, Belgium, under the supervision of Peter Van den haute, funded through the Institute of Sciences and Technology (also in collaboration with the Geology and Mineralogy Dept. of the Royal Museum of Central Africa, Brussels and the Dept. of Mineralogy, Geology and Geophysics of the University of Novosibirsk, Russia). The working title is Apatite FT thermochronology of some Central-Asian mountain belts. The initial focus is on the Altai mountains in the border zone of Russia, Mongolia, China and Kazachstan. Some samples are now in hand, and this summer another fieldtrip is planned. If time permits he will consider dating zircon samples as well, and/or sampling other terrains (probably in the Tien Shan mountains in Kyrghystan).

His address is: Johan De Grave, Dept. of Mineralogy, Petrology and Micropedology Krijgslaan 281/S8, B-9000 Gent, Belgium. Tel.: ++32 (0)9 264 45 64
Fax : ++32 (0)9 264 49 84.

Phil Armstrong wants to let everyone know that he is setting up an FT lab at Calif. State Univ., Fullerton, and wants to inquire about where to get his hands on glass and sample age standards. Phil's background is in structure and thermal geophysics with a fairly strong background in FT interpretation (working with Peter Kamp in NZ. (Ed.: Unfortunately, Phil doesn't yet have an e-mail address at Calif. State yet, but if anyone wants to get in touch, his new address is in the Int. Directory in the issue.)

And finally, **John Decker** (or was it his automated message service?) e-mailed me to say that he is no longer with ARCO, and has moved to Balikpapan, on the island of Borneo, where he receives money from Unocal. His family will follow sometime in the summer. His new e-mail address is: **jdecker@unocal.com**.

Slightly longer Tracks: Improve apatite separates using dilute M.I.

by Sandy Grist
Fission Track Research Laboratory, Department of Earth Sciences,
Dalhousie University, Halifax, Nova Scotia, Canada B3H 3J5

The most common problem that I have encountered in the latter stages of purification of apatite separates is the presence of carbonates, quartz and other felsic mineral grains which should have been removed during initial heavy liquid separation using tetrabromoethane (TBE) or sodium polytungstate (SPT). This is especially true for me now that I do almost all my initial SPT separations in large open-topped centrifuge bottles and remove the 'lights' using a large spoon (There is always a small amount of the light fraction reintroduced into the liquid during the 'spooning-out' process.). However, I am not alone in this, nearly all the samples that I receive as concentrates need additional purification to remove either contaminating felsic minerals or zircons that have been introduced to the separate because they adhered to the inside wall of the separatory funnel during TBE or MI separation. I used to remove the contamination the only way that I knew of, which was by redoing as necessary the TBE and MI.

One particularly difficult sample that I processed consisted of about 500-800 apatite grains in about 15 grams of carbonate (I believe it was dolomite.) and represented about a week of nearly impossible picking. The technique that I used instead took about 45 minutes resulted in a separate that was >95% pure apatite.

It is done like this. You fill a 125 ml squibb separatory funnel with MI (s.g. = 3.3 g/cm^3) to height of the base of the painted-on white oval or hexagon (where the maker intends you to write your sample number) which represents about 75-80 ml of liquid. Add your sample. (If any starts to sink, redo the standard MI separation and after you draw off the heavies, refill the funnel to the base of the oval with MI again. This removes any contamination by zircons.) Here is good part. Add between 6 and 10 ml of acetone (s.g. = 0.8 g/cm^3) to the top of the liquid (I use a wash bottle to wash any grains down on the inside of the funnel.) and stir <u>vigorously</u>. If you add 6 ml of acetone the resulting liquid has an s.g. of 3.1 g/cm^3, and apatite barely sinks. If you add 10 ml, the resulting liquid has an s.g. of 3.0 g/cm^3 and the apatite readily sinks. In practice I add the acetone until the layer of acetone is about 5 mm thick (Hey, its not rocket science.). Remove the stirrer, and cap tightly (otherwise the acetone begins to evaporate from the top of the liquid and you get density driven convection, which is not helpful.). After about a half-hour you can draw off the heavy fraction (MI-medium) and all of the quartz and carbonate contamination will be in the light fraction.

The only apparent drawback with this method is that if you are processing many samples you end up diluting a substantial amount MI, and since it is expensive, most of us don't have a large volume of it to begin with. The way around this is to keep the dilute MI apart from the MI wash, and blow a bit of air over it for about 2 hours. This drives off all the acetone, and restores the density (check it with a piece of Durango). This means that you can do one group of samples in the morning and another in the afternoon.

This method represents an improvement over redoing TBE and MI for impure samples because it is done in 1 funnel in 1 step, and because the density of the dilute MI is higher than that of TBE, so your separate is purer. The need to streamline the separation process and to remove much-hated TBE from my life has led me to this refinement that I believe produces consistently, significantly better apatite separates, often nearly 100% pure.

Special Announcement: 31st International Geological Congress,Rio de Janeiro, August 6-17, 2000

by Gérard Poupeau
ESA-CNRS, Université Joseph Fourier, 15 rue Maurice Gignoux
38031 Grenoble, France

Year 2000 might be a very fruitful one for fission-trackers, with two international get-togethers : in addition to the Lorne meeting in February (see announcement in the this issue), there will be one session of the Rio de Janeiro 31st IGC partly devoted to FT dating. Those of you who received the first circular may have noted that sub-Symposium 18-1 on Geochronology was entitled "Fission track, Thermoluminescence and Cathodoluminescence". This session was proposed under the initiative of Ariadne do Carmo Fonseca, from the Federal University of Ceará at Fortaleza. Following an IGC-31 Scientific Committee meeting held on last month, this title has now been reformulated as "Fission track, Thermoluminescence, Electron Spin Resonance and Optical dating", with three conveners, Gérard Poupeau and Ariadne do Carmo Fonseca for FTD, and Gérard Poupeau and Alexandre M. Rossi for the other methods.

There will be one half-day poster session and another one for a few selected talks and round tables. We remind you that abstracts, of no more than 250 words, must be submitted before September 1st. We count on your participation.

Rio de Janeiro and the Guanabara bay are one of the world most fantastic sites. We will be happy to welcome you there. Remember also that Brazil has a rich and varied geology and that many field trips are proposed in the frame of the congress.

General information on IGC31 can be found on the Congress web site :

http://www.31igc.org

You can also consult the conveners at:

poupeau@ujf-grenoble.fr ; ariadne@ufc.br or ariadne@degeo.ufc.br ; rossi@cbpf.br

Man, obsidian, fission tracks and archaeology in the Near- and Middle-Orient

by Gérard Poupeau

Fission-track dating of obsidian started from the early times of fission-track dating, as its application to archaeology. Although "burnt" obsidians might help in the dating of archaeological sites (albeit with large uncertainties), the conjuncture is a rare one (only a few published cases) and the "standard" application of obsidian FT dating in archaeology is about provenance studies.

Provenance studies of prehistoric obsidian artifacts (from which volcano, primary, or secondary source, came the raw material for tool-knapping?) were initiated in Japan by the end of the sixties, in the Mediterranean and Near- to Middle-Orient regions since the seventies and along the Andean belt of South America in the eighties. This approach was applied concurrently to or in conjunction with the more traditional geochemical one.

In the Near- and Middle-Orient, obsidian is present in archaeological sites about 14,000 a BP. A collective book on the present status of obsidian studies in this region, including FT provenance studies: L'obsidienne au Proche et Moyen Orient. Du volcan à l'outil* ("Obsidian in the Near and Middle Orient, from volcano to tool"), was published late last year. It is organized into two parts, respectively on Geology, Geochemistry, and Chronometry, and on Archaeology. Each part is divided into eight essays. The first ones are about methods of obsidian characterization, with comprehensive reviews of chemical composition and age (K-Ar, fission track) data on geological obsidians and obsidian artifacts. The second ones are about obsidian artifacts, with chapters on case studies, the symbolic meaning of obsidian, the distribution of obsidian in archaeological sites of the area considered since nearly 14,000 a BP to the post-Neolithic, and one chapter on the history of the word "obsidian".

The book is mostly written in French, with two English essays on FT dating, by Poupeau, Bigazzi et al. on methodology and Bigazzi, Poupeau et al. on a review of relevant FT data, and a third one by Blackman et al. on the chemical composition of Caucasian obsidians.

*Edited by M.-C. Cauvin, A. Gourgaud, N. Arnaud, G. Poupeau, J.-L. Poidevin et C. Chataigner, BAR International Series 738, Archaeopress, Oxford (England), 1998, pp. 388.

Fission Track 2000

Conference Update

More than 130 scientists have responded to the first circular for the 9th International Conference on Fission Track Dating and Thermochronology to be held in Lorne, Australia on 6-11 February, 2000. To date about 85 oral presentations and 45 posters have been offered.

Expressions of interest in the Conference have been received from more than 25 different countries indicating a wide interest in fission track analysis and its modern applications in Earth and related sciences. The Conference promises to bring a truly international perspective to the present state of Fission Track Dating and Thermochronology.

There has also been an enthusiastic response to participation in each of the pre- and post-conference excursions outlined in the first circular. The numbers are certainly sufficient for us to organize these trips, so these will now be offered. An accompanying persons program is also planned. Lorne is a superb conference setting, and the Organizing Committee assures delegates and accompanying persons that a stimulating and memorable meeting is being organized.

The second circular will be posted on the conference web site from July 1, 1999 at:

http://ft2000.unimelb.edu.au

Please consult this site for further details and take note of organizational deadlines.

Getting back to basics: Implications for zircon fission track ages for tuffs associated with hominid sites in central Flores, Indonesia

by Paul B. O'Sullivan and Asaf Raza
Victorian Institute of Earth and Planetary Sciences, La Trobe University,
Bundoora, Victoria, 3083, Australia.

NOTE: The discussion below is a summary of recently published zircon fission track results. The results and implications are presented herein purely to highlight a use of fission track dating that doesn't seem to have been used much over the last few years. For the original and complete text please see:

Morwood, M.J., O'Sullivan, P.B., Aziz, F., and Raza, A., 1998, Fission track ages of stone tools and fossils in central Flores, Indonesia: Nature, v. 392, p. 173-176.

Abstract

It has long been argued that early hominids did not posses the ability to cross large expanses of open water and therefore could not radiate from the western islands of Indonesia across "Wallace's line" into eastern Indonesia and then into Australia until ~40,000-60,000 years ago. To test this theory, zircon fission track ages have been determined for tuffaceous deposits containing fossils and stone artifacts in the Ola Bula Formation, central Flores, Indonesia, which lies to the east of "Wallace's line". Primary igneous zircons from a tuff located at the base of the Tangi Talo artifact site indicate an age of 0.90 ± 0.07 Myr, while zircons obtained for tuffs located immediately below and within a deposit containing stone artifacts from the Mata Menge locality gave ages of 0.88 ± 0.07 and 0.80 ± 0.07 Myr respectively. Since at least two long-distance water crossings must have occurred to reach Flores, these findings imply that early hominids had greater capabilities than previously suggested.

Introduction

Prior to human intervention the Wallacean islands located between the Asian and Australian continental areas (Fig. 1), had impoverished terrestrial faunas comprised of species capable of making water crossings and then establishing biologically viable populations. With a few exceptions, mammals on the Wallacean islands were originally derived from continental S.E. Asia and must have arrived by swimming, rafting on flotsam, or flight (e.g., Johnson, 1980). Evidence from the island of Java, which at various times during Pleistocene sea level fluctuations was connected to the Asian mainland, suggests the earliest hominid species, Homo erectus, first appeared in S.E. Asia between 1.0 and 1.8 Ma (de Vos & Sondaar, 1994). To move eastward from Java across "Wallace's line" to the Wallacean islands required the use of watercraft in order to make sea crossings of at least 20 km, even at times of low sea level. This is generally believed to have been beyond the capacity of Homo erectus populations, therefore the islands of eastern Indonesia were not occupied until as recently as 40,000 and 60,000 years ago (e.g., Davidson & Noble, 1992). However, zircon fission track dates from two locations on the island of Flores indicate that by the Middle Pleistocene H. erectus had successfully progressed eastward across "Wallace's line" and therefore must have possessed the ability to use watercraft to make sea crossings of at least 20 km.

Background Information

Tangi Talo and Mata Menge are two of the many palaeontological sites located in the Ola Bula Formation of the upper Ae Sissa River basin, central Flores (Fig. 1). The Ola Bula is a maximum of 80 meters thick and comprises tuffaceous sediments underlying later fluvial deposits (Fig. 2; Lumbanbatu & Aziz 1994; Morwood et al., 1997). At the base of Tangi Talo the remains of an endemic fauna occur in a white tuffaceous deposit about 1 meter thick, and although angular volcanic rock fragments are locally present in the deposits, none of these have characteristics suggesting that they are artifacts (Morwood et al., 1997). Paleomagnetic determinations showed that deposits at Tangi Talo were dominated by reverse polarities but contained two levels with normal polarities. These were interpreted to represent the Jaramillo normal polarity subzone with a date of ~900,000 BP (Sondaar et al., 1994).

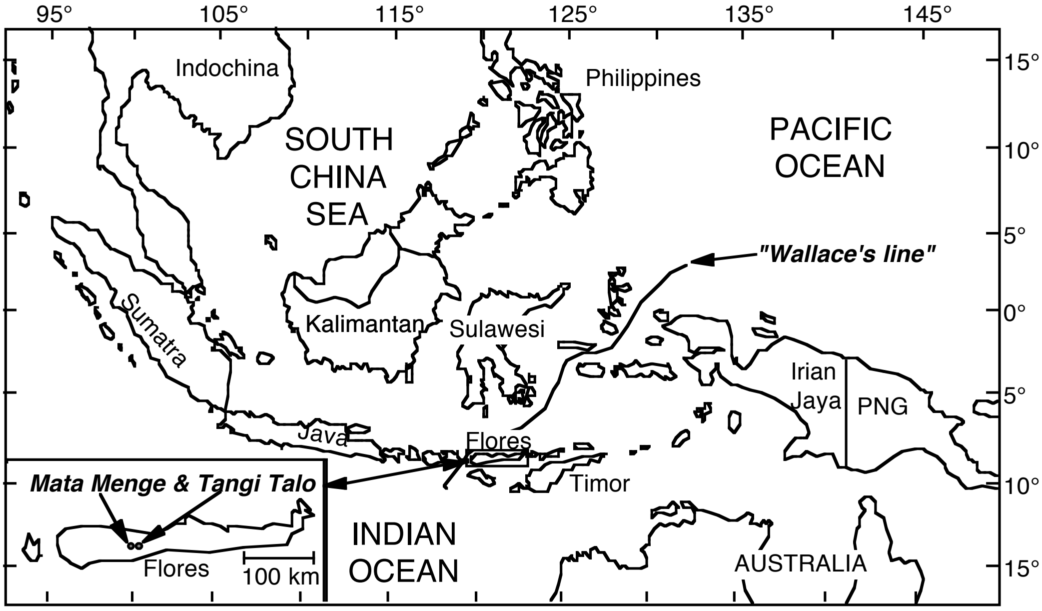

Figure 1: Regional location map showing the islands of Indonesia, including Flores, the approximate locations of the Mata Menge and Tangi Talo archeology sites, and "Wallace's line".

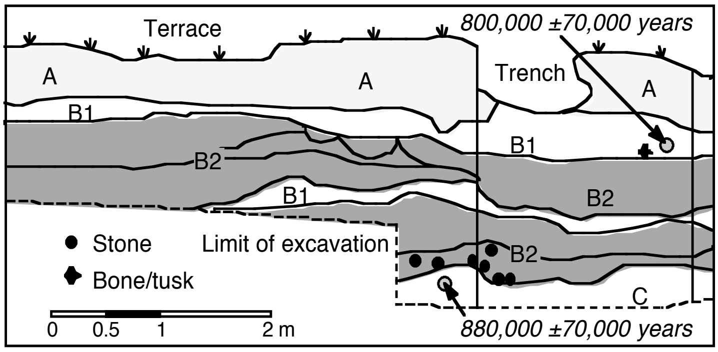

Figure 2: The west baulk of the excavations at Mata Menge showing the locations and calculated ages of the fission track samples. Three main stratigraphic units are evident. Unit A is a layer of weathered sandstone and topsoil. Unit B comprises layers of white volcanic tuff (B1) and tuffaceous sandstone (B2), which contains all the stone artifacts identified in the section. Unit C is pink volcanic tuff, which does not contain fossils or stone artifacts.

At Mata Menge endemic fauna as well as pieces of volcanic rock and chert previously identified as artifacts (e.g., Maringer & Verhoeven, 1970; Morwood et al., 1997), occur in a horizontal fluvial layer up to 120 cm thick (Unit B, Fig. 2). At the base of Unit B is a homogeneous, pink tuffaceous silt (Unit C), which contains neither fossils nor stone artifacts. In addition, since Ola Bula lies near to and 31 meters stratigraphically above Tangi Talo, Mata Menge is younger than Tangi Talo. Paleomagnetic determinations showed that deposits at Mata Menge contained a reversed-normal transition in deposits 3 meters below the fossil-rich, Unit B, which was interpreted as representing the Matuyama-Brunhes boundary (Sondaar et al., 1994). The excavators thereby inferred a date of slightly less than 730,000 BP for the faunal remains - although a date of about 780,000 BP for this event is more likely (see Berggren et al., 1990). The reverse polarities indicated that deposits of the Ola Bula Formation just below the fossil deposits at Tangi Talo and Mata Menge were older than the 780,000 year-old Matuyama-Brunhes boundary, but the paleomagnetic work did not date the fossil deposits themselves.

Zircon fission track results and interpretations

In an attempt to constrain the age of the deposits and artifacts at Mata Menge and Tangi Talo, samples for zircon fission track dating were collected from three tuffaceous horizons. This method of radiometric dating is ideal for dating young deposits as shown previously by Gleadow (1980). The stratigraphic positions of the two samples taken from Mata Menge are shown in Fig. 2: sample MM1 comprised a block of the red tuffaceous deposit immediately below the lowest fossils and identified stone artifacts, while MM2 was taken from a white tuffaceous deposit next to a large Stegodon tusk. In addition, TTI was taken from the white tuffaceous layer at Tangi Talo next to an in situ Pygmy Stegodon tusk and pieces of Geochelone carapace. Deposition of these tuffs in their present locations is thought to have occurred rapidly after the eruptions which produced them, therefore measured ages of the primary igneous zircons can be related directly to the stratigraphic ages of the tuffaceous layers and the fossils they contain (e.g., Gleadow, 1980).

A minimum of 50-60 individual zircon grains were dated from each sample. Afterwards, data from grains deemed to be obvious contamination, based on their significantly older ages, were removed before a final age calculation was made. Analytical results are shown in Table 1 for both primary and reworked zircons from the three tuffaceous samples. Distributions of the primary grain ages from each sample are shown in Figure 3. It can be seen that the Tangi Talo sample (TT1) yielded a date of 0.90±0.07 Myr, while the two Mata Menge samples (MM1 and MM2) yielded dates of 0.88±0.07 and 0.80±0.07 Myr respectively (Morwood et al., 1998). Furthermore, each sample contained between 4 and 7 older reworked zircons that gave ages of between 7 and 14 Myr, significantly older than the primary zircons (Table 1). These older contaminates also contained significantly lower amounts of Uranium, a factor which could also have been used to delineate between the primary and contaminate zircons.

Table 1. Fission track analytical results: Tuffaceous samples from Flores, Indonesia.

Sample Number (# grains)	Lat. (°S) Long. (°E)	Unit name	Standard track density ($\times 10^5$ cm^{-2})	Fossil track density ($\times 10^5$ cm^{-2})	Induced track density ($\times 10^6$ cm^{-2})	Chi squared probability (%)	Uranium (ppm)	Fission track age (Ma±1σ)
Primary Zircon - Mata Menge								
MM1	8°20'	Ola Bula	4.060	1.139	3.311	33.1	318.0	0.88±0.07
(44)	121°30'		(1631)	(199)	(5784)			
MM2	8°20'	Ola Bula	4.087	1.040	3.340	15.1	318.7	0.80±0.07
(53)	121°30'		(1631)	(189)	(6067)			
Primary Zircon - Tangi Talo								
TT1	?	Ola Bula	4.114	1.195	3.441	100.0	326.2	0.90±0.07
(56)	?		(1631)	(184)	(5297)			
Detrital contamination - Mata Menge								
MM1	-	-	-4.060	9.171	1.766	0.0	169.7	9.8±3.1
(6)	-		(1631)	(229)	(441)			
MM2	-	-	-4.087	4.200	1.642	0.1	156.6	7.5±1.7
(7)	-		(1631)	(98)	(383)			
Detrital contamination - Tangi Talo								
TT1	-	-	-4.114	0.136	1.312	0.0	124.4	14.0±8.3
(4)	-		(1631)	(89)	(86)			

Brackets show number of tracks counted. Standard and induced track densities measured on mica external detectors (g=0.5), and fossil track densities on internal mineral surfaces. Zircon ages calculated using zeta=125.5±3 for dosimeter glass CN1 (analyst: P. O'Sullivan).

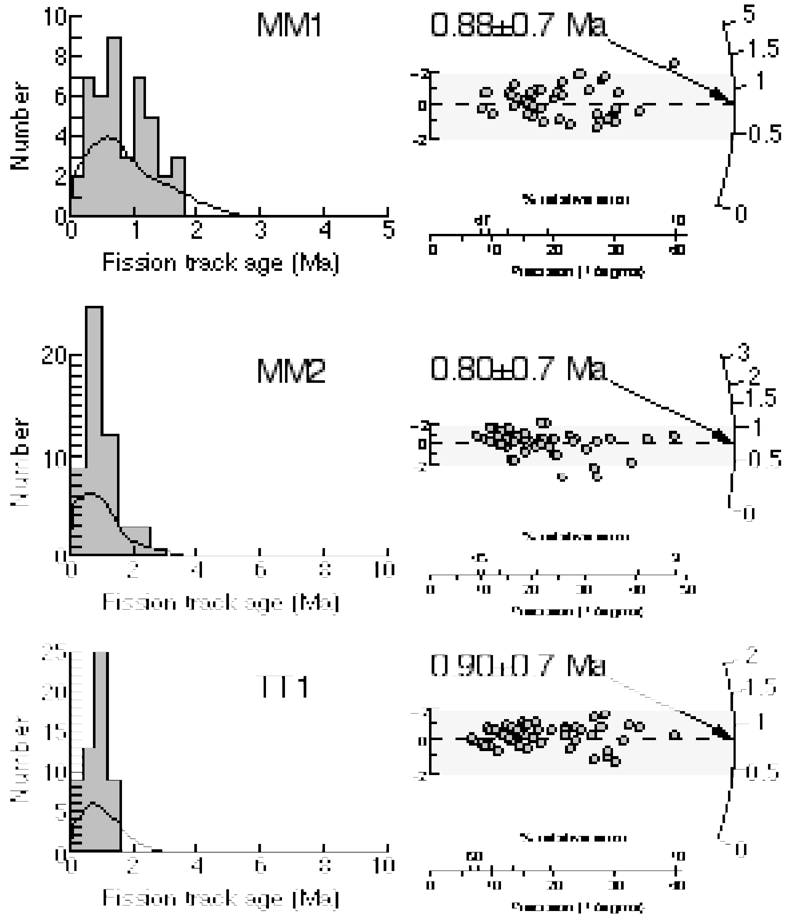

Figure 3: Single grain age results in the form of simple histograms and radial plots from the three Mata Menge and Tangi Talo tuffaceous units.

The zircon dates indicate that the endemic fauna at Tangi Talo are ~0.90 Myr old and appear to predate evidence for hominids on Flores, while the Mata Menge dates indicate that hominids had colonized the island by ~0.88-0.80 Myr. These results confirm the claims originally made by Maringer & Verhoeven (1970) for the Middle Pleistocene age of fossil faunas and stone artifacts at Mata Menge. They also closely match the dates for Tangi Talo and Mata Menge suggested previously on the basis of paleomagnetic determinations. Furthermore, these findings indicate that H. erectus had the capacity to make water crossings of up to 20 km distance from which there are a number of implications. Firstly, the complex logistic organization needed to build watercraft capable of transporting a biologically and socially viable group implies that H. erectus must have had language. Previously the organizational and linguistic capacity required for sea voyaging was thought to be the prerogative of modern humans and to have only appeared in the late Pleistocene (Davidson & Noble, 1992). Finally, the colonization of Flores in the Middle Pleistocene indicates that the technological capacity of early hominid populations may have been seriously underestimated. The recent discovery of well-designed, well -crafted and possibly composite spears at the 400,000 year old Schoningen kill site in Germany supports this view (Thieme, 1997). Elsewhere, the capacity of hominids to undertake even limited water crossings is not evident until much later.

References

Berggren, W.A., Kent, D.V.,Swisher III, C.C. & Aubry, M.P., 1990. A Revised Cenozoic geochronology and chronostratigraphy. In Geochronology, Time Scales and Global Stratigraphic Correlation, Berggren, W.A. D.V. Kent, M.P Aubry, and J. Hardenbol (eds). S.E.P.M., Spec Publ. No. 54., pp. 129-212.

Davidson, I. & Noble, W., 1992. Why the first colonisation of the Australian region is the earliest evidence of modern human behaviour. Archaeology in Oceania 27(3): 135-42.

Gleadow, A.J.W., 1980. Fission track ages of the KBS Tuff and associated hominid remains in northern Kenya. Nature 284 (5753): 225-230.

Johnson, D.L., 1980. Problems in the land vertebrate zoogeography of certain islands and the swimming powers of elephants. Journal of Biogeography 7: 383-98.

Lumbanbatu, U.M. & Aziz, F., 1994. Aspek fosil vertebrata dari Forasi Olabula, Flores. Jurnal Geologi dan Sumberdaya Mineral 33(4): 2-6.

Maringer, J. & Verhoeven, T., 1970. Die Steinartefakte aus der Stegodon - Fossilschicht von Mengeruda auf Flores, Indonesien. Anthropos, 65: 229-47.

Morwood, M.J., Aziz, F., van den Bergh, G.D., Sondaar, P.Y., & de Vos, J., 1997. Stone artifacts from the 1994 excavations at Mata Menge, west central Flores, Indonesia. Australian Archaeology 44: 26-34.

Morwood, M.J., O'Sullivan, P.B., Aziz, F., and Raza, A., 1998, Fission track ages of stone tools and fossils in central Flores, Indonesia: Nature 392: 173-176.

Sondaar, P.Y., van den Bergh, G.D., Mubroto, B., Aziz, F., de Vos, J., & Batu, U.L., 1994. Middle Pleistocene faunal turnover and colonization of Flores (Indonesia) by Homo erectus. Comptes Rendues de la Academie des Sciences, Paris. 319, Series II: 1255-1262.

Thieme, H., 1997. Lower Paleolithic hunting spears from Germany. Nature 385: 807-810 (1997).

Vos, J. de & Sondaar, P.Y., 1994. Dating hominid sites in Indonesia. Science 266: 1726-1727.

Recent Fission-Track Papers

Here is a list of recently or soon-to-be published fission track papers that were submitted by the authors for inclusion in this issue of On Track. I am grateful to the authors for the information. If you have a paper that you would like to see listed in this section, please send the complete reference or a photocopy of the first page to the editor. A copy of the entire paper would also be appreciated. We are also interested in non-fission-track papers that may be of special interest to the fission-track community. Papers in press are welcome, please include an estimate of the expected month of publication.

Bllot-Gurlet L., Calligaro Th., Dorighel O., Dran J.-C., Poupeau G. et Salomon J. (1998) PIXE analysis and fission track dating of obsidian from South American prehispanic cultures : an insight over the circulation of a lithic industry raw material, Nuclear Instruments and Methods B, 150, 616-621.

Bigot-Cormier F., Poupeau G., Sosson M., Stiphan J.-F., Labrin E., Ziad N. et Schwartz S. (1999) Fission-track record and exhumation rates of the Argentera External Crystalline Massif (Western Alps, France-Italy), "Fission-Track Analysis: Theory and Applications", Chatillon (Italie), 11-14 Juillet, extended abstract (in press)

Garver, J.I., Soloviev, A.V., Bullen, M.E., Brandon, M.T., 1999, Exhumation of Okhotsk-Chukotka and West Kamchatka arcs recorded by detrital fission-track ages of zircon from Ukelayat Flysch, Kamchatka: European Geophysical Society, The Hague, Netherlands, April 1999.

Huntoon, J.E., Hansley, P.L., and Naeser, N.D., 1999, The search for a source rock for the giant Tar Sand triangle accumulation, southeastern Utah: American Association of Petroleum Geologists Bulletin, v. 83, no. 3, p. 467-495.

Miller, E.L., Dumitru, T.A., Brown, R.W., Gans, P.B. 1999, Rapid Miocene slip on the Snake Range-Deep Creek Range fault system, east-central Nevada, Geologica Society of America Bulletin, v. 111, no. 6, p. 886-905.

Naeser, N.D., Naeser, C.W., Morgan, B.A., III, Schultz A.P., and Southworth, C.S., 1999, Cooling history c the Blue Ridge Province, Virginia, North Carolina and Tennessee, from apatite and zircon fission-trac analysis [abs.]: Geological Society of Americ Abstracts with Programs, v. 31, no. 3, p. A-32.

Naeser, N.D., Isaacs, C.M., and Keller, M.A., 199 Regional thermal maturity of surface rocks, onshor Santa Maria basin and Santa Barbara-Ventura basi area, California, in Keller, M.A., ed., Evolution c sedimentary basins/onshore oil and ga investigations--Santa Maria province: U.S Geological Survey Bulletin 1995-X, 31 p.; 1 colo plate, scale 1:750,000.

[note: Naeser, N.D., Isaacs, C.M., and Keller, M.A., 199 is a non-fission-track paper, but is included because i discusses the correlation and limitations of a numbe of other thermal maturity indicators widely used i basin analysis, including Rock-Eval pyrolysis data vitrinite reflectance, and Thermal Alteration Inde (TAI)]

Soloviev, A, Garver, J.I., and Shapiro, M., 1999, Timing c arc-continent collision using fission track ages c detrital zircon from the Lesnaya Group, Kamchatk Peninsula, Russia. European Geophysical Society The Hague, Netherlands, April 1999.

Call for Contributions to the May/June 2000 On Track issue 19

The next issue of On Track is scheduled for release in late May/June, 2000 and we are looking for contributions. On Track welcomes contributions of virtually any kind, including news, gossip, job openings, descriptions of new lab techniques, reviews of useful products, raving editorials about what all the other labs are doing wrong, meeting announcements, cartoons, and descriptions of what you are doing in your research.

If you would like to contribute, **PLEASE** send the final text no later than May 15, 2000. If you propose to submit a substantial article, **PLEASE** let the editor know ASAP.

On Track includes a list of recent and forthcoming Fission Track papers. If you know of a paper that was published recently or is in press and should appear in the near future, please let me know so that it can be added to the list. Also, if you happen to move locations (or know someone who has moved) due to a change in jobs or finishing off the thesis and graduating, please inform us.

On Track is also happy to run Advertisements. Please contact the editor for advertising rates. On Track has remained free of charge and will continue to do so (at least for the near future). However, to save costs we generally mail only one copy per lab so please be sure to photocopy the lab copy and pass copies around your lab. If possible, we will also send out On Track electronically, so please make sure the editor has an up-to-date e-mail address for each person/lab. Send contributions to:

Richard Spikings, Geology Institute, ETH-Zentrum Sonneggstrasse, 5 8092, Zurich, Switzerland
Tel.: 0041-1-632-7702, Fax: 0041-1- 632-1080 **Email: spikings@erdw.ethz.ch**

1999 UPDATE OF THE INTERNATIONAL FISSION-TRACK DIRECTORY

This directory is published solely for the information of fission-track researchers. It is neither a comprehensive directory including all fission-track researchers nor an official document endorsing the scientific stand of individuals by the fission-track community. We provide here an update with the hope that we have accounted for the changes in addresses that have occurred since the last release of the directory. ***If you have changed your address, know someone else who has or think that someone should be on this list, please let the Editor know*** **(*Spikings@erdw.ethz.ch*).**

Aizawa, Minoru
Dept. of Geology
Imperial College
Prince Consort Road
London SW7 2BP, *UK*
Tel.: +44 (0) 171-594-6468
Fax: +44 (0) 171-594-6464
E: m.aizawa@ic.ac.uk

Andriessen, Paul A.M.
Laboratorium voor Isotopen Geologie
Faculteit der Aardwetenschappen
Vrije Universiteit de Boelelaan 1085
1081 HV Amsterdam, *The Netherlands.*

Armstrong, Phil
Dept. of Geosciences
P.O. Box 6850
California State University, Fullerton
Fullerton, CA 92834-6850 *USA*

Arne, Dennis C.
Dept. of Geology
Univ. of Ballarat, P.O. Box 663
Ballarat, VIC 3352, *Australia*
Tel.: 61-53-279-290,
Fax: 61-53-279-144
E: D.Arne@ballarat.edu.au

Bal, K. D.
Fission Track Laboratory
KDM Institute of Petrol. Exploration
Oil and Natural Gas Corporation
Dehradun, *India.*

Baldwin, Suzanne
Dept. of Geosciences
Univ. of Arizona
Tucson, AZ 85721, *USA*

Balestrieri, Maria Laura
Dipartimento di Scienze della Terra
via S. Maria, 53
56126 Pisa, *Italy*

Barbero, Luis
Dpto Geologia Facultad de Ciencias del Mar
Universidad de Cadiz
1150 Puerto Real, Cadiz
Spain
Tel.: int-34-956-470864
Fax: int-34-956-470811

Belton, Dave X.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-2630
Fax: 61-3-479-1272
E: geodxb@luff.latrobe.edu.au

Bergman, Steven C.
ARCO International Oil & Gas Co.
PLC J2435
2300 W. Plano Parkway
Plano, TX 75075-8499, USA
Tel.: 1-972-509-6264
Fax: 1-972-509-6941
E: steve_bergman@mail.arco.com
(home: steve_bergman@ibm.net)

Bigazzi, Giulio
Instituto di Geochronologia e Geochimica Isotopica,
CNR, via Cardinale Maffi, 36
56127 Pisa, *Italy*
Tel.: +39-50-560430/560110
Fax: +39-50-589008

Blythe, Ann E.
Dept. of Earth Sciences
Univ. of Southern California
Los Angeles, CA 93106, *USA*
E: blythe@earth.usc.edu

Boettcher, Stefan S.
Dept. of Geological Sciences
Univ. of Texas at Austin
Austin, TX 78712, *USA*
Tel.: 1-512-471-8547
Fax: 1-512-471-9425
E: sboett@maestro.geo.utexas.edu

Bojar, Ana-Voica
Insitute für Geologie and Paläontologie
Karl-Franzens Universität
Heinrichstraße 26
A-8010 Graz, *Austria*
Fax: 43-316-382885

Brandon, Mark T.
Dept. of Geology and Geophysics,
Kline Geology Laboratory
P.O. Box 6666
Yale Univ.
New Haven, CT 06511, *USA*

Brix, Manfred R.
Ruhr-Universität Bochmum,
Fakultat fur, Geowissenschaften
Institu fur Geologie
Postfach 102148
Universitätsstraße 150
D-W 4630 Bochum 1, *Germany*
Tel.: +49-234-700-3236
Fax: +49-234-709-4179

Brown, Roderick W.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-1368
Fax: 61-3-479-1272
E: rod.brown@latrobe.edu.au

Brunel, Maurice
ISTEEM GGP laboratory CC 058
Universite Montpellier II
1 Place E. Bataillon
34095 Montpellier
Cedex,, *France*
E: brunel@dstu.univ-montp2.fr

Burchart, Jan
Institute of Geological Sciences
Polish Academy of Sciences
Zwirki i Wigury 93
02-089 Warsaw, *Poland*

Buck, Steve
Mobil North Sea Ltd.
Union Row
Aberdeen AB1 1SA, Scotland *UK*
E: spbuck@abz.mobil.com

Calmus, Thierry
Instituto de Geología
Estación Regional del Noroeste
Universidad Nacional Autonoma de México
Apartado Postal 1039
Hermosillo, Sonora, 8300, *Mexico*
E: tcalmus@servidor.unam.mx

Carlson, William D.
Dept. of Geological Sciences
Univ. of Texas at Austin
Austin, TX 78712, *USA*
Tel.: 1-512-471-4770
Fax: 1-512-471-9425
E: wcarlson@ccwf.cc.utexas.edu

Carpena, Joelle
DSD-SCS-LGCA
C.E.N. Cadarache
13108 Saint Paul lez Durance CDX, *France*

Carpenter, Stephen B.
A505 Administration Bldg.
National Institute of Standards and Technology,
Gaithersburg, MD 20841, *USA*

Carter, Andrew
Fission Track Research Group
Dept. of Geological Sciences
Univ. College London
London WC1E 6BT, *UK*
Tel.: (0)171-380-7777 ext 2418
Fax: (0)171-813-2802
E: a.carter@ucl.ac.uk

Cederbom, Charlotte
Institution of Geology
Earth Sciences Centre
S-413 81 Gothenburg, *Sweden*
Tel.: +46 31 773 2800
Fax: +46 31 773 2849
E: cederbom@geo.gu.se

Chambaudet, Alain
Universite de Franche-Comte
U.F.R. des Sciences et des Techniques,
Laboratoire de Microanalyses Nucleaires,
16 route de Gray
F-25030 Besancon Cedex, *France*

Clavero, Jorge
Sernageomin
Av. Sta. Maria 0104
Casilla 10465
Providencia, Santiago de Chile
Tel: (56-2) 737-5050
Fax: (56-2) 777-1906
E: JClavero@SERNAGEOMIN.cl

Coleman, Max
Research Inst. for Sedimentology
The Univ. of Reading
PO Box 227, Whiteknights
Reading, RG6 6AB, *UK*

Cloos, Mark
Dept. of Geological Sciences

Univ. of Texas at Austin
Austin, TX 78712, *USA*
Tel.: 1-512-471-4170,
Fax: 1-512-471-9425
E: cloos@maestro.geo.utexas.edu

Corrigan, Jeff D.
ARCO Exploration & Production
2300 W. Plano Parkway
Plano, TX 75075, *USA*
Tel.: 1-214-509-4090
E: dprjdc@arco.com

Coyle, David A.
Tensor Information Systems, *USA*
Home: 1102 New Dover Rd.
Apex, NC, 27502-7129, *USA*
Tel.: 1-919-303-6607
E: dcoyle@tensor.com
or: dcoyle@objectfarm.org

Crowley, Kevin, D.
Director
Board on Radioactive
Waste Management,
National Research Council
2101 Constitution Ave., N.W.
Washington, D.C. 20418, *USA*
Tel.: 1-202-334-3066,
Fax: 1-202-334-3077
E: kcrowley@nas.edu

Currie, Lisel
Institute of Sedimentary and
Petroleum Geology
3303-33rd St., NW
Calgary, Alberta, T2L 2A7, *Canada*
Tel.: 1-403-292-7004,
Fax: 1-403-292-4961
E: lcurrie@gsc.NRCan.gc.ca

Danahara, Tohro
Kyoto Fission-Track Co., Ltd.
44-4 Minamitajiri-cho, Kita-ku,
Kyoto 603, *Japan*
Tel.: +81-75-493-0684
Fax.: +81-75-493-0741
E: BYU02730@niftyserve.or.jp

De Corte, Frans
Institute for Nuclear Sciences
Univ. of Gent
Proeftuinstraat 86
B-9000 Gent, *Belgium*

Decker, John E.
ARCO International, Inc.
Jakarta, *Indonesia*
E: jdecker@unocal.com

De Wispelaere, Antoine
Institute for Nuclear Sciences
Univ. of Gent
Proeftuinstraat, 86
B-9000 Gent, *Belgium*
Tel.: +32-9-264-6627
Fax: +32-9-264-6699
E: antoine.dewispelaere@rug.ac.be

de Wit, M.C.J.
De Beers Consolidated Mines Ltd
P.O. Box 7383, Centurion, 0046
Pretoria, *South Africa*

Dodson, Martin H.
Dept. of Earth Sciences
Univ. of Leeds
Leeds, LS2 9JT, *UK*

Dokka, Roy K.
Dept. of Geology
Louisiana State Univ.
Baton Rouge, LA 70803, *USA*
Tel.: 1-504-388-2975

Donelick, Raymond A.
Donelick, Margaret B.
Donelick Analytical, Inc.
1075 Matson Road Viola, Idaho
83872-9709 U.S.A.
voice: +1-208-875-2332
fax: +1-208-875-8881
E: donelick@apatite.com

Dorighel, Olivier
Groupe de Geophysique Nucleaire
Univerite Joseph Fourier
Institut Dolomieu
15, Rue Maurice - Gignoux
38031 Grenoble Cedex, *France*

Duddy, Ian R.
Geotrack International Pty Ltd
37 Melville Road
West Brunswick
VIC 3055, *Australia*
Tel.: +61-3-9380-1077
Fax: +61-3-9380-1477
E: mail@geotrack.com.au

Dumitru, Trevor A.
Dept. Geol. & Env. Sci.,
Stanford Univ.
Stanford, CA 94305-2115, *USA*
Tel.: 1-415-725-1328,
Fax: 1-415-725-2199
E: trevor@pangea.stanford.edu

Duncan, Alasdair
BP Exploration
PG8G (2/4S W10)
301 St. Vincent Street
Glasgow, G2 5DD, Scotland, *UK*

Dunkl, Istvan
Institute of Geology
University of Tuebingen
Sigwartstrasse 10
Tuebingen, D-72076 *Germany*
Tel: +49-7071-297-2494
Fax: +49-7071-5059
E: istvan.dunkl@uni-tuebingen.de

Durrani, Saeed A.
School of Physics and Space
Research,
Univ. of Birmingham,
Birmingham B15 2TT, *UK*
Tel.: +44-21-414-4691/4655
Fax: +44-21-414-4693

Eby, G. Nelson
Dept. Environmental, Earth &
Atmospheric Sciences
University of Massachusetts
Lowell, MA 01854
Tel: 1-978-934-3907
Fax: 1-978-934-3069
E: Nelson_Eby@uml.edu

Evarts, Russ
U.S. Geological Survey, MS-999
345 Middlefield Road
Menlo Park, CA 94025, *USA*

Fayon, Annia K.
Dept. of Geology and Geophysics
108 Pillsbury Hall
310 Pillsbury Dr SE
Minneapolis, MN 55455, *USA*
Fax: 1-612-625-3819
E: fayon001@tc.umn.edu

Fisher, David E.
Dept. of Geological Sciences
Univ. of Miami
Miami, FL 33124-0401, *USA*
Tel.: 1-305-284-3254
Fax: 1-305-284-4258

Fitzgerald, Paul G.
Dept. of Geosciences
Univ. of Arizona,
Tucson, AZ 85721, *USA*
Tel.: 1-602-621-4052
Fax: 1-602-621-2672
E: kiwi@sapphire.geo.arizona.edu

Fleischer, Robert L.
Dept. of Geology
Union College
Schenectady, NY 12308, *USA*
Tel.: +1 (518) 388-6985
Fax.: +1 (518) 388-6789
E: fleischr@union.edu

Foland, Sara S.
Amoco Production Company
1670 Broadway
P.O. Box 800
Denver, CO 80201, *USA*

Foster, David A.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-1516
Fax: 61-3-479-1272
E: D.Foster@latrobe.edu.au

Fugenschuh, Bernhard
Geologisches Institut
Univ. of Basel, Basel, *Switzerland*

Galbraith, Rex F.
Dept. of Statistical Science
Univ. College, Gower Street
London, WC1E 6BT, *UK*
Tel.: +41-71-380-7192
Fax: +44-71-383-4703
E: rex@stats.ucl.ac.uk

Gallagher, Kerry.
Dept. of Geology
Imperial College,
London, SW7 2BT, *UK*
Tel: 0171-594-6424
Fax: 0171-594-6464
E: kerry@ic.ac.uk

Ganzawa, Yoshiro
Hokkaido Univ. of Education
1-2 Hachiman-cho
Hakodate, 040, *Japan*
Tel.: 81-0138-41-1121
Fax: 81-0138-42-3982

Garver, John I.
Dept. of Geology
Union College
Schenectady, NY 12308-2311, *USA*
Tel.: 1-518-388-6517,
Fax: 1-518-388-6789
E: garverj@union.edu

George, Pete
Dept. of Geological Sciences
Univ. of Texas at Austin
Austin, TX 78712, *USA*

Gibson, Helen
Geotrack International Pty Ltd
37 Melville Road
West Brunswick
VIC 3055, *Australia*
Tel.: +61-3-9380-1077
Fax: +61-3-9380-1477
E: mail@geotrack.com.au

Giegengack, Robert
Geology Dept.
Univ. of Pennsylvania
Philadelphia, PA 19104-6316, *USA*

Giger, Matthias
Dammweg 27
3604 Thun, *Switzerland*
Tel.: 0041-33-368-227

Giles, Melvin R.
EPT-HM
Volmerlaan 8
Risswijk, *The Netherlands*
E: gilesm@siep.shell.com

Glasmacher, Ulrich
Forschungsstell Archaometrie der Heidelberger Akademie der Wissenschaften
Max Planck Institut fur Kernphysik
Postfach 103980
69029 Heidelberg, *Germany*
Tel.: +49 (6221) 516-321
Fax: +49 (6221) 516-633
E: ua.glasmacher@mpi-hd.mpg.de

Gleadow, Andrew J. W.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-2649
Fax: 61-3-479-1272
E: A.Gleadow@latrobe.edu.au

Graefe, Kirsten
Institut fuer Geologie
Universitaet Tuebingen
Sigwartstrasse 10
D-72076 Tuebingen, *Germany*
E: graefe@uni-tuebingen.de

Green, Paul F.
Geotrack International Pty Ltd
37 Melville Road
West Brunswick
VIC 3055, *Australia*
Tel.: +61-3-9380-1077
Fax: +61-3-9380-1477
E: mail@geotrack.com.au

Grist, Alexander
Dept. of Earth Sciences
Dalhousie Univ.
Halifax, Nova Scotia, B3H 3J5, *Canada*
Tel.: 1-902-494-2372
Fax: 1-902-494-6889
E: agrist@is.dal.ca

Grivet, Manuel
Universite de Franche-Comte
U.F.R. des Sciences et des Techniques
Laboratoire de Microanalyses Nucleaires
16, route de Gray
F-25030 Besancon Cedex, *France*

Guglielmetti, Alessandra
Instituto di Fisica Generale Applicata
Via Celoria 15
20133 Milano, *Italy*
E: guglielmetti@mi.infn.it

Gunnell, Yanni
Laboratoire de Geographie Physique,
URA, 1562, CNRS,
Univesité Blaise-Pascal,
29 Bvd. Gergovia, 63037,
Clermont Ferrand, CEDEX 1, *France*

Hadler, Julio C.
Instituto de Fisica "Gleb Wataghin"
Universidade Estadual de Campinas
UNICAMP, Campinas, SP, *Brazil*
Caixa Postal 6165
CEP 13083-970
Tel.: 55-19-788-5522
Fax: 55-19-788-5512

Hansen, Kirsten
Geological Institute
Oster Volgrade 10, DK-1350
Kobenhavn K, *Denmark*
Tel.: (home) 45-31-42-18-94
Fax: 45-33-14-84-33
E: kirstenh@geo.geol.ku.dk

Harman, Rebecca
Department of Geology
Imperial College,
London, SW7 2BT.*UK*
Tel.: (0171) 589-5111 ext. 56411
E: r.harman@ic.ac.uk

Harrison, Mark T.
Dept. of Earth and Space Sciences
Univ. of California, Los Angeles
Los Angeles, CA 90024, *USA*

Hasebe, Noriko
Dept. of Science for Natural Environment
Division of Physical Sciences
Kanazawa University
Kanazawa 920-1192, *Japan*
Tel. 81-76-264-5727
Fax: 81-76-264-5746
E: hasebe@kenroku.ipc.kanazawa-u.ac.jp

Hashemi-Nezhad, S.R.
Dept. of Physics
Tabriz Univ.
Tabriz, *Iran*

Hayashi, Masao
Kyushu Sangyo Univ.
Fukuoka 813, *Japan*
Tel.: 092-673-5883,
Fax: 092-673-5899

Hegarty, Kerry A.
Geotrack International Pty Ltd
37 Melville Road
West Brunswick
VIC 3055, *Australia*
Tel.: +61-3-9380-1077
Fax: +61-3-9380-1477
E: mail@geotrack.com.au

Hejl, Ewald R.
Institut fur Geologie und Palaontologie
Universitat Salzburg,
Hellbrunnerstraße 34/III
A-5020 Salzburg, *Austria*
Tel.: + 43-662-8044-5437/5400
Fax: + 43-662-8044-621
E: ewald.hejl@sbg.ac.at

Hill, Kevin C.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-1273
Fax: 61-3-479-1272
E: K.Hill@latrobe.edu.au

Himeno, Osamu
Dept. of Mining Eng
Kyyushu Univerity
Hakozaki, Fukuuka 812-81, *Japan*
Tel.: 092-642-3635
E: himeno@mine.kyushu-u.ac.jp

Honda, Teruyyki
Atomic Energy Research Laboratory
Musashi Institute of Technology
Kawasaki 215, *Japan*

Hulver, Michael L.
Dept. of the Geophysical Sciences
Univ. of Chicago
5735 S. Ellis Avenue
Chicago, Illinois 60637, *USA*

Hungerbuhler, Dominik
Dept. Erdwissenschaften
ETH-Zentrum
CH-8092, Zurich, *Switzerland*

Hurford, Anthony J.
Research School of Geological Sciences, Univ. and Birbeck Colleges, London WC1E 6BT, *UK*
Tel.: +41-71-380-7704
Fax: +44-71-388-7614
E: t.hurford@ucl.ac.uk

Iriarte, Sergio
Sernageomin
Av. Sta. Maria 0104
Casilla 10465
Providencia, Santiago de Chile
Tel: (56-2) 737-5050
Fax: (56-2) 777-1906
E: SIriarte@SERNAGEOMIN.cl

Issler, Dale R.
Geological Survey of Canada
Institute of Sedimentary and Petroleum Geology
3303-33rd St., NW
Calgary, Alberta, T2L 2A7, *Canada*
Tel.: 1-403-292-7172,
Fax: 1-403-292-5377
E: dissler@gsc.nrcan.gc.ca

Ito, Hisatoshi
Central Research Institute of Electric Power Industry (CRIEPI)
1646 Abiko, Abiko city,
Chiba, 270-1194, *Japan*
Tel.: 81-471-82-1181 ext 8525
Fax: 81-471-83-3182
E: ito_hisa@criepi.denken.or.jp

Iwano, Hideki
Kyoto Fission-Track Co., Ltd.
44-4 Minamitajiri-cho, Kita-ku,
Kyoto 603, *Japan*
Tel.: +81-75-493-0684
Fax.: +81-75-493-0741
E: BYU02730@niftyserve.or.jp

Jacobs, Joachim
Fachbereich 5, Geowissenschaften
Universitaet Bremen Postfach
330440 28334 Bremen, *Germany*
Tel: 0421-218-3995
Fax: 0421-218-3993
E: jojacobs@geopol.uni-bremen.de

Johnson, Kit
Fission Track Research Group
Dept. of Geological Sciences
Univ. College London
London WC1E 6BT, *UK*
Tel.: (0)171-380-7777 ext 2418
Fax: (0)171-813-2802
E: kit.johnson@ucl.ac.uk

Jolivet, Marc
ISTEEM GGP laboratory CC 058
Universite Montpellier II
1 Place E. Bataillon
34095 Montpellier
Cedex,, *France*
E: jolivet@dstu.univ-montp2.fr

Jonkheere, Raymond
Particle-track-dating Laboratory,
Max Planck Institut fur Kernphysik
D-69117 Heidelberg, *Germany*
Tel.: +49 (6221) 516-337
Fax.: +49 (6221) 516-633
E: raymond@goanna.mpi-hd.mpg.de

Kamp, Peter J.
Dept. of Earth Sciences
Univ. of Waikato
Hamilton 2001, *New Zealand*
Tel.: 64-7-856-2889
Fax: 64-7-856-0115

Kelley, Shari A.
Department of Earth and Envir. Sciences

New Mexico Tech
Soccoro, NM 87544, *USA*
Tel.: (505) 661-6171
E: kelley@griffey.nmt.edu
sakelley@ix.netcom.com

Kendrick, Dan
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-1273
Fax: 61-3-479-1272
E: geordk@luff.latrobe.edu.au

Ketcham, Richard
Dept. of Geological Sciences
Univ. of Texas at Austin
Austin, TX 78712, *USA*
Tel.: 1-512-471-5763,
Fax: 1-512-471-9425
E: richk@maestro.geo.utexas.edu

Kim, Joong Wook
Dept. of Science Education
Taegu Natl' Univ. of Education
Daemyung-2 Nam-gu, Taegu, 705-715, *Korea*
Tel.: 82-53-620-1343
Fax: 82-53-620-1340
E: jwkim@taekyo.taegu-e.ac.kr

Kohn, Barry P.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-1516/1274,
Fax: 61-3-479-1272
E: B.Kohn@latrobe.edu.au

Koshimizu, Satoshi
Yamanashi Institute of
Environmental Sciences
Kamiyoshida, Fujiyoshida,
Yamanashi 403-0005, *Japan*
Tel.: 81-555-72-6194
Fax: 81-555-72-6206
E: koshi@yies.pref.yamanashi.jp

Kowallis, Bart Joseph
Dept. of Geology
Brigham Young Univ.
Provo, UT 84602, *USA*
Tel.: 1-801-378-2467
Fax: 1-801-378-2265

Krochmal, Michael
Autoscan Systems Pty. ltd.
PO Box 112
Ormond, VIC 3204 *Australia*
Tel.: + 61 39 596 8065 / 8092
Fax: + 61 39 596 8369
E: autoscan@autoscan.com.au

Lal, Nand
Dept. of Geophysics
Kurukshetra Univ.
Kurukshetra-132119, *India*

Laslett, Geoff
CSIRO Mathematical and
Information System
Priv. Bag 10, Clayton South MDC,
Clayton,VIC 3169, *Australia*
Tel.: +61 3 9545 8018
Fax.: +61 3 9545 8080
E: Geoff.Laslett@cmis.csiro.au

Lewis, Cherry L. E.
Robertson Research Int. Ltd.
Llanrhos, Llandudno, Gwynedd,
North Wales, LL30 1SA, *UK*

Linn, Jon
WVDEP/TAGIS
10 McJunkin Rd,
Nitro, WV 25143, *USA*
Tel.: (304) 759-0519
Fax: (304) 759-0565
E: jlinn@crimson.osmre.gov

Lisker, Frank
FB5 - Geowissenschaften
Universitaet Bremen
PF 330440 Bremen, *Germany*
E: flisker@geopol.uni-bremen.de

Lutz, Timothy M.
Dept of Geology and Astronomy
West Chester University
West Chester, PA 19383, *USA*

Mahon, Keith I.
Exxon Production Research
Company, MS: ST-2164
P.O. Box 2189
Houston, TX 77252-2189, *USA*
Tel.: +1 (713) 965-7036
Fax: +1 (713) 965-2779
E: kmahon@dialaccess.com

Maksaev, Victor
Dept. of Geology,
University of Chile
Casilla 13518, Correo 21, Santiago, *Chile*
Tel.: (562) 678 4112
Fax: (562) 696 3050
E:
vmaksaev@tamarugo.cec.uchile.cl

Märk, E.
Hohrere technische Bundeslehr-
und Versuchsanstalt Anichstr.
26-28, A 6020 Innsbruck, *Austria*

Märk, T. D.
Abt. f. Kernphysik u.
Gaselektronik
Institut f. Experimentalphysik
Leopold Franzens Universität
A 6020 Innsbruck, *Austria*

Marshallsea, Susan
Geotrack International Pty Ltd
37 Melville Road
West Brunswick
VIC 3055, *Australia*
Tel.: +61-3-9380-1077
Fax: +61-3-9380-1477
E: mail@geotrack.com.au

Matsuda, Takaaki
Himeji Institute of Technology
2167, Shosha Himeji
Hyogo 671-22, *Japan*

Maze, Will B.
Exxon Production Research
P.O. Box 2189
Houston, TX 77252-2189, *USA*
Tel.: 1-713-965-7223
Fax: 1-713-965-7951

McCorkell, Robert
CANMET, Mineral Technology
Energy, Mines and Resources
555 Booth Street
Ottawa, Ontario K1A 0G1, *Canada*

McCulloh, Thane H.
7136 Aberdeen
Dallas, TX 75230, *USA*
Tel.: 1-214-691-6809

Meyer, Arnaud J.
ELF AQUITAINE-CSTJF L1/010
64018 Pau Cedex, *France*

Miller, Elizabeth L.
Dept. of Geology, Stanford Univ.
Stanford, CA 94305-2115, *USA*
Tel.: 1-415-723-1149
Fax: 1-415-725-2199
E: miller@pangea.stanford.edu

Mitchell, Melinda M.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-1274,
Fax: 61-3-479-1272
E: geomm@luff.latrobe.edu.au

Moore, Marilyn
Geotrack International Pty Ltd
37 Melville Road
West Brunswick
VIC 3055, *Australia*
Tel.: +61-3-9380-1077
Fax: +61-3-9380-1477
E: mail@geotrack.com.au

Mora, Jorge
Dept. of Geological Science
State Univ. of New York
Albany, NY 12222, *USA*

Mora, Jorge
Escuela de Geologia
Minas y Geofisica
Facultad de Ingenieria
Universidad Central de Venezuela
Caracas, *Venezuela*

Murphy, John M.
Dept. of Geology and Geophysics
Univ. of Wyoming
Laramie, WY 82071, *USA*
Tel.: 1-307-766-5435
E: geojm@uwyo.edu

Naeser, Chuck & Nancy
U.S. Geological Survey
926a National Center
Reston, VA 22092, *USA*
Tel.: 703 648-6964 (Chuck)
Tel.: 703 648-5328 (Nancy)
Fax: 703 648-6953 (both)
E: cnaeser@usgs.gov

Nishimura, Susumu
Dept. of Geology and Mineralogy
Kyoto Univ.
Kyoto 606, *Japan*
Tel.: 81-75-753-4150,
Fax: 81-75-753-4189

Noble, Wayne P.
Fission Track Research Group
School of Earth Sciences
University of Melbourne
Parkville, 3052, *Australia*
ph (WK) int + (613) 9344 7215
ph (HM) int + (613) 9531 4438
FAX int + (613) 9344 7761
E:
w.noble@earthsci.unimelb.edu.au

Oddone, Massimo
Dipartimento di Chimica Generale
viale Taramelli, 12
27100 Pavia, *Italy*

Ohira, Hiroto
Dept. of Geoscience,
Shimane Univ.,
Matsue 690, *Japan*
Tel.: 81-852-32-6465
Fax: 81-852-32-6469
E: ohira@botan.shimane-u.ac.jp

Olesch, Martin
Univ. Bremen
FB 5 Geowissenschaften
Postfach 330 440
2800 Bremen, 00071-00 *Germany*
Tel.: +49-421-2183940
Fax: +49-421-2183993

Omar, Gomaa I.
Geology Dept.
Univ. of Pennsylvania
Philadelphia, PA 19104, *USA*

Ono, Masako

Hokkaido University
Kyoyo-chigaku
N17-W8, Kita-ku
Sapporo, 060, *Japan*
Tel.: 81-11-716-2111, ext. 5309
Fax: 81-11-736-3290
E: mo@epms.hokudai.ac.jp

O'Sullivan, Andrea J.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-3517
Fax: 61-3-479-1272
E: allanw@met.Unimelb.EDU.AU

O'Sullivan, Paul B.
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-9479-3517
Fax: 61-3-9479-1272;
E: P.Osullivan@latrobe.edu.au

Pagel, Maurice
Universiti de Paris XI –
ORSAYTERRE Bbt. 504
90405 Orsay Cedex, *France*
Tel.: 33-1-69-15-67-55
Fax: 33-1-68-15-48-82

Pagliuca, Renato
Dept. of Geological Sciences
Pavia University
Via Ferrata, 1
27100 PAVIA, *Italy*
Tel.: +39-382-50-5839
Fax: +39-2-523-0197
E: ullayu@tin.it

Pan , Yun
Dept. of Geological Sciences
Univ. of SUNY at Albany
NY 12222, *USA*

Parand, Simon
Geological Survey of Iran,
P.O. Box 13185-1494 Tehran, *Iran*
Fax: 98216009328

Paul, Tracy A.
Dept. of Chemistry
Arizona State Univ.
Tempe,. AZ 85287-1404, *USA*
Tel.: 1-602-921-1306
E: agtxp@asuacad

Pengji, Zhai
Institute of High Energy Physics
Academia Sinica
P.O. Box 2732
Beijing 100080, *PR China*

Perelygin, V. P.
Flerov Laboratory of Nuclear Reactions
Joint Institute for Nuclear Research
Post Office Box 79
101 000 Moscow, *Russia*

Perez De Armas, Jaime G.
Dept. of Geology and Geophysics
Rice University., MS-126
Houston, TX 77025, *USA*
E: jaime@rice.edu

Petford, N.
Bullard Lab.
Dept. of Earth Sciences
Univ. of Cambridge
Madingly Rise
Cambridge, CB3 0DZ, *UK*

Poupeau, Gerard R.
Universite Joseph Fourier
Institut Dolomieu
15, Rue Maurice - Gignoux
38031 Grenoble Cedex, *France*
Tel.: (33)-(0)4-76-63-59-30 / 59-64
Fax: (33)-(0)4-76-87-82-43
E: Poupeau@ujf-grenoble.fr

Prashad, Rajinder
Fission Track Laboratory
KDM Institute of Petrol. Exploration
Oil and Natural Gas Corporation
Dehradun, *India.*

Price, P. Buford
Dept. of Physics
Univ. of California
Berkeley, CA 94720, *USA*
Tel.: 1-510-642-4982,
Fax: 1-510-643-8497
E: price@lbl.qov

Puch, Thomas
Insitute für Geologie and
Paläontologie
Karl-Franzens Universität
Heinrichstraße 26
A-8010 Graz, *Austria*
Fax: 43-316-382885

Qvale, Henning
Institute for Energy Technology
P.O. Box 40
N 2007, Kjeller, *Norway*
Tel.: +47-63-80-61-22,
Fax: +47-63-81-55-53
E: hq@varney.ite.no

Rahn, Meinert
Institut fuer Mineralogie,
Petrologie und Geochemie
Univ. of Freiburg
Albertstrasse 23b
79104 Freiburg, *Germany*
Tel: 49-761-2036416
Fax: 49-761-2036407
E: meinert@mis01.mineralogie.uni-freiburg.de

Ratschbacher, Lothar
Institut fuer Geologie
Universitaet Wuerzburg,
Pleicherwall 1, D-97070
Wuerzburg, *Germany*
Tel.: +49-931-312580
Fax: +49-931-312378
E: lothar@geologie.uni-wuerzburg.de

Ravenhurst, Casey E.
Dept. of Geology and Geography
Univ. of Massachusetts
Amherst MA 01003, *USA*
E: cravenhu@geo.umass.edu

Raza, Asaf
Department of Earth Sciences
La Trobe University
Bundoora, VIC 3083, *Australia*
Tel.: 61-3-479-2630
Fax: 61-3-479-1272
E: geoar@luff.latrobe.edu.au

Rebetez, Michel
Universite de Franche-Comte
U.F.R. des Sciences et des Techniques
Laboratoire de Microanalyses Nucleaires
16, route de Gray
F-25030 Besancon Cedex, *France*

Redfield, Thomas F.
Technical Exploration Services
5 Frost Court
Mill Valley, CA 94941, *USA*

Roden-Tice, Mary, K.
Center for Earth & Environ. Science
SUNY Plattsburgh
Plattsburgh, NY 12901, *USA*
Tel.: 1-518-564-2019
Fax: 1-518-564-3152

Ruiz, Geoffrey
Geological Institute
Sonnegstrasse, 5
ETH Zentrum, 8092 Zurich
Switzerland
Tel: 41 1632 37 02
Fax: 41 1632 10 80

Saenz, Carlos Alberto Tello
Instituto de Fisica "Gleb Wataghin"
Universidade Estadual de Campinas
UNICAMP, Campinas, SP, *Brazil*
Caixa Postal 6165
CEP 13083-970
Tel.: 55-19-788-5522
Fax: 55-19-788-5512
E: saenz@ifi.unicamp.br

Saini, Hari Singh
Dept. of Radiometric Dating
Birbal Sahni Institute of
Paleobotany
53 Univ. Road
Post Box 106
Lucknow 226 007, *India*

Sandhu, Amanjit S.
Dept. of Physics
Guru Nanak Univ.
Amritsar 143005, *India*
E: cse@gndu.ernet.in

Schaefer, Thorsten
Universitaet Bremen Fachbereich
Geowissenschaften PO Box 330
440 D-28334 Bremen, *Germany*
Tel.: 0049 421 218 3994
Fax: 0049 421 218 3993
E: postgrad@geopol.unibremen.de

Schierl, Heimo
Institut f. Geologie und
Palaeontologie,
Universität Salzburg,
Hellbrunnerstraße 34/III,
A-5020 Salzburg, *Austria*
Tel.: + 43-662-8044-5437
Fax: + 43-662-8044-621

Schwab, Martina
Institut fuer Geologie
Universitaet Tuebingen
Sigwartstrasse 10, D-72076
Tuebingen, Germany
E: martina.schwab@uni-tuebingen.de

Sekyra, Gerd
Institut f. Geologie und
Palaeontologie,
Universität Salzburg,
Hellbrunnerstraße 34/III,
A-5020 Salzburg, *Austria*
Tel.: + 43-662-8044-5437
Fax: + 43-662-8044-621

Seward, Diane
Geology Institute
ETH-Zentrum
Sonneggstrasse, 5
8092, Zurich, *Switzerland*
Tel.: 0041-1- 632-7702,
Fax: 0041-1- 632-1080
E: diane@eurasia.ethz.ch

Shane, Phil
School of Environ. & Marine Sci.
Univ. of Auckland
Tamaki Campus
Private Bag 92019
Auckland, *New Zealand*

Tel.: 64-9-373 7599 ext. 6821
Fax: 64-9-373 7042
Shunsheng, Liu
Changsha Institut of Geotectonics
Academia Sinica
Changsha 410013
Hunan Province, *PR China*
Tel.: 86-731-8859165
Fax: 86-731-8859137
Siddall, Ruth
Fission Track Research Group
Geological Sciences
Univ. College London
London WC1E-6BT, *UK*
Tel.: 0171-380-7777 ext. 2758
Fax: 0171-388-7614
E: r.siddall@ucl.ac.uk
Singh, Gurinder
Dept. of Physics
Guru Nank Dev Univ.
Amritsar 143005, *India*
Sobel, Ed
Institut fuer Geowissenschaften
Universität Potsdam
Postfach 60 15 53
D-14415 Potsdam, *Germany*
Tel: (49) (0331) 977-2904 or -2047
Fax: (49) (0331) 977-2087
E: sobel@rz.uni-potsdam.de
Sohrabi, Mehdi
Radiation Protection Dept.
Atomic Energy Organization of
Iran P.O. Box 14155-4494
Tehran, *Iran*
Soloviev, Alexie
Institute of the Lithosphere
Russian Academy of Sciences
Statomonetnyi per. 22
Moscow, 109180, *Russia*
Sorkhabi, Rasoul B.
Dept. of Geology
Arizona State Univ.
Tempe, AZ 85287-1404, *USA*
Tel.: 1-602-965-9852/5081
Fax: 1-602-965-8102
E: idrbs@asuvm.inre.asu.edu
Spikings, Richard
Geology Institute
ETH-Zentrum
Sonneggstrasse, 5
8092, Zurich, *Switzerland*
Tel.: 0041-1- 632-7702,
Fax: 0041-1- 632-1080
E: spikings@erdw.ethz.ch
Stapel, Gerco
Inst. voor Aardwerenschappen
Vrije Universiteit
De Boelenlaan 1085
1081 HV Amsterdam, *The Netherlands*
E: stag@geo.vu.nl
Steckler, Michael S.
Lamont-Doherty Earth Observatory
Palisades, NY 10964, *USA*
Tel.: 1-914-365-8479,
Fax: 1-914-365-8179
E: steckler@ldeo.columbia.edu
Steinmann, Michael
Dept. Erdwissenschaften
ETH-Zentrum
CH-8092, Zurich, *Switzerland*
Stiberg, Jan-Petter
Institute for Energy Technology
P.O. Box 40, N 2007
Kjeller, *Norway*
Tel.: +47-63-80-61-22,
Fax: +47-63-81-55-53
Stockli, Danny
Dept. Geological Sciences
Stanford Univ.
Stanford, CA 94305-2115, *USA*
Tel.: (415) 723 1010
E: danny@pangea.stanford.edu
Stockmal, Glen S.
Geological Survey of Canada
Institute of Sedimentography and
Petroleum Geology
3303-33rd Street, N.W.
Calgary, Alberta T2L 2A7, *Canada*
Tel.: 1-403-292-7173
Fax: 1-403-292-5377
E: GStockma@NRCan.gc.ca
Storzer, Dieter
Museum d'histoire naturelle
Laboratoire de Mineralogie
61 rue Buffon,
75005 Paris, *France*
Stump, Edmund
Dept. of Geology
Arizona State Univ.
Tempe, AZ 85287-1404, *USA*
Tel.: 1-602-965-3971/5081
Fax: 1-602-965-8102
E: ateds@asuacad.
Sumii, Tomoaki
Isotope Geoscience Section
Geochemistry Dept.
Geological Survey of Japan
1-1-3 Higashi, Tsukuba, 305, *Japan*
Tel.: 81-298-54-3558,
Fax: 81-298-54-3533
E: sumii@gsj.go.jp
Summerfield, Michael
Dept. of Geography
School of Earth Sciences
Univ. of Edinburgh
Edinburgh EH8 9XP, *UK*
Tel.: +44-31-650-2519
Sun, Shaohua
Changsha Institut of Geotectonics
Academia Sinica
Changsha 410013
Hunan Province, *PR China*
Tel.: 86-731-8887945 (home)
Fax: 86-731-8859137
E: shaohua@ms.csig.ac.cn
Suzuki, Masao
Rikkyo Univ.
34-1 Nishi Ikebukuro
3-Chome, Toshima-ku
Tokyo 171, *Japan*
Tagami, Takahiro
Dept. of Geology and Mineralogy
Kyoto Univ.
Kyoto 606, *Japan*
Tel.: 81-75-753-4153
Fax: 81-75-753-4189
E: tagami@terra.kueps.kyoto-u.ac.jp
Talbot, James
K/T GeoServices, Inc.
661 North Plano Rd, Suite 317
Richardson, TX 75081, *USA*
Tel.: (972) 437-9337
Fax: (972) 437-0455
E: jptkt@flash.net
Thomson, Stuart
Institut für Geologie
Ruhr-Universität Bochum
Universitätsstraße 150
P.O. Box 102148
Bochum 44721, *Germany*
Toro, Gloria
Universidad EAFIT
A.A. 3300
Medellin, *Colombia*
E: gtoro@sigma.eafit.edu.co
Upton, David
Fission Track Research Group
Dept. of Geological Sciences
Univ. College London
London WC1E 6BT, *UK*
Tel.: (0)171-380-7777 ext 2418
Fax: (0)171-813-2802
Vance, Joseph, A.
Dept. of Geological Sciences
Univ. of Washington
Seattle, WA 98195, *USA*
Van den haute, Peter
Geologisch Instituut
Rijiks Universiteit
B-9000 Gent, *Belgium*
Tel: +32-0-9-264/4592 or 6627
Fax: +32-0-9-264-4984
E: Peter.Vandenhaute@rug.ac.be
Van der Wateren, F. M.
Institue for Earth Science
Vrije Universiteit
De Boelelaan 1085, 1081 HV
Amsterdam, *The Netherlands*
Ventura, Barbara
Dipartimento di Scienze Geologiche
Universita di Bologna
via Zamboni 67
40127 Bologna, *Italy*
Tel: +39-51-354579
Fax: +39-51-354522
E: ventura@geomin.unibo.it
Vercoutere, Caroline
Geologisch Instituut
Rijiks Universiteit
B-9000 Gent, *Belgium*
Viola, Giulio
Geologisches Institut
Sonneggstrasse 5
ETH-Zentrum
CH-8092, Zurich, *Switzerland*
Tel.: 0041-1-252-2227
Fax: 0041-1-252-7008
E: giulio@erdw.ethz.ch
Virk, H. S.
Dept. of Physics
Guru Nanak Dev Univ.
Amritsar-143005, *India*
Wadatsumi, Kiyoshi
Dept. of Geosciences
Osaka City Univ.
3-3-138 Sugimoto
Sumiyoshi-ku
Osaka 558, *Japan*
Wagner, Gunther A.
Max-Planck-Institut fur
Kernphysik, Postfach 103980
D-69029 Heidelberg, *Germany*
E: gwagner@goanna.mpi- hd.mpg.de
Wagner, Martin
Institut fur Petrographie und
Geochimie
Universität Karlsruhe
Kaiserstr. 12
D-7500 Karlsruhe, *Germany*
Wallace, Wes K.
Dept. of Geology and Geophysics
University of Alaska
Fairbanks, AK 99775-5780 , *USA*
Tel.: (907) 474-5386
Fax: (907) 474-5163
E: wallace@gi.alaska.edu

Walgenwitz, Frederic
ELF AQUITAINE-CSTJF L1/010
64018 Pau Cedex, *France*
Walker, J. D.
Dept. of Geology
Univ. of Kansas
120 Lindley Hall
Lawrence, KS 66045-2969, *USA*
Walker, Robert M.
McDonnell Center for Space Sciences
Campus Mail 1105
Washington Univ.
St. Louis, MO 63130, *USA*
Tel.: 1-314-935-6225
Fax: 1-314-935-6219
E: brw@wuphys.wustl.edu
Walter, Bob
Institute of Human Origins
1288 Ninth Street
Berkely, CA 94709-1211, *USA*
Tel.: 1-510-525-0500,
Fax: 1-510-525-0668
E: bwalter@iho.org
Waraich, R. S.
Fission Track Laboratory
KDM Institute of Petrol. Exploration
Oil and Natural Gas Corporation
Dehradun, *India*.
Watanabe, Koichiro
Dept. of Mining
Faculty of Engineering
Kyushu Univ.,
36 Hakozaki, Fukuoka 812, *Japa*n
Tel.: 81-92-642-3634
E: wat@mine.kyushu-u.ac.jp
Weiland, Richard J.
Dept. of Geological Sciences
Univ. of Texas at Austin
Austin, TX 78712, *USA*
Tel.: 1-512-471-8547,
Fax: 1-512-471-9425
E:weiland@maestro.geo.utexas.edu
Westgate, John A.
Dept. of Geology
Univ. of Toronto
Scarborough, Ontario
M1C 1A4, *Canada*
E: westgate@banks.scar.utoronto.ca
Willet, Sean D.
Dept of Geological Sciences
University of Washington,
Seattle, WA 98195 *USA*
Tel.: 206 543-8653
Fax: 206 543-3836
E: swillett@u.washington.edu
http://www.geology.washington.edu/~willett/
Yamada, Ryuji
Nagaoka Institute of Snow and Ice Studies, National Research Institute for Earth Science and Disaster Prevention, STA, Japan
9400082 Suyoshi, Nagaoka,
Niigata, *Japan*
Tel.: +81-258-35-7522
Fax: +81-258-35-0020
E: ryamada@nagaoka.bosai.go.jp
Winkler, Jennifer
ARCO Exploration & Production
2300 W. Plano Parkway
Plano, TX 75075-8499, *USA*
E: jwinkle@mail.arco.com
Yamashita, Tohru
Kyoto Fission-Track Co., Ltd.
44-4 Minamitajiri-cho, Kita-ku,
Kyoto 603, *Japan*
Tel.: +81-75-493-0684
Fax.: +81-75-493-0741
E: BYU02730@niftyserve.or.jp
Yang, Tsanyao Frank
Dept. of Geology, National Taiwan University, 245 Chou-shan Road,
Taipei 106-17, *Taiwan*
Tel: (+886) 2-2369-5568
Fax: (+886) 2-2363-6095
E: tyyang@ccms.ntu.edu.tw
Yegingil, Zehra
Physics Dept.
Cukurova Univ.
P.O. Box 171
01330 Adana, *Turkey*
Yoshioka, Tetsu
Kyoto Fission-Track Co., Ltd.
44-4 Minamitajiri-cho, Kita-ku
Kyoto 603, *Japan*
Tel.: +81-75-493-0684
Fax: +81-75-493-0741
E: BYU02730@niftyserve.or.jp
Zattin, Massimiliano
Dipartimento di Scienze Geologiche
Universita di Bologna
via Zamboni 67
40127 Bologna, *Italy*
Tel: +39-51-354579
Fax: +39-51-354522
E: zattin@geomin.unibo.it
Zhao, Yunlong
Beijing Research Institute of Uranium Geology
P.O. Box 764
Beijing 100029, *PR China*
Zeitler, Peter K.
Dept. of Earth & Environ. Sciences
Lehigh Univ.
Bethlehem, PA 18015, *USA*
Tel.: 1-215-758-3671
Fax: 1-215-758-3677
E: pkz0@lehigh.edu
Zentilli, Marcos,
Dept. of Earth Sciences
Dalhousie Univ.
Halifax, Nova Scotia, B3H 3J5, *Canada*
Tel.: 1-902-494-3873
Fax: 1-902-494-6889
E: marcos.zentilli@dal.ca
Zhou, Zuyi
Dept. of Marine Geology and Geophysics, Tongji University
1239 Siping Road 200092 Shanghai, *China*
Tel.: 0086-21-65982358
Fax: 0086-21-65026278
E: zzydmg@tju.ihep.ac.cn
Zimmerman, Robert Allen
U.S. Geological Survey, MS 905
Box 25046, Federal Center
Denver, CO 80225, *USA*
Tel.: 1-303-236-5626,
Fax: 1-303-236-5603
E: zimm@greenwood.ct.usgs.gov.internet
Zuffa, Gian G.
Dipartimento di Scienze Geologiche
Universita di Bologna
via Zamboni 67
40127 Bologna, *Italy*
Tel.: 39-51-354536
Fax: +39-51-354522
E: zuffa@geomin.unibo.it

The last page!

By: Anon E. Mous

What's in a Name?

People often see or hear whatever they are expecting to see or hear. It's like waiting for a bus. Every vehicle that appears on the horizon looks like your bus. As a case in point, we are a lab that operates inside a university, and sometimes people phone looking for some other department. I always answer the phone like this:

"Good morning/afternoon, fission track lab." (just in case it's someone important calling to either offer me a job or ask about our commercial rate for a batch of 150 samples). Here is a sampling of some of the responses that I get to that greeting. (Some are not that far from the truth.)

"Fraction tricks?" (looking for Mathematics and Statistics Department, or Tracker)
"Friction traps?" (Physics)
"Vision tricks?" (Neuropsychology)
"Bric-a-bracs?" (History)
"Fishing trips?" (Marine Biology, No we don't go out in the boats to collect samples.)
"Fission chips?" (Physics again)
"Yea, I'd like to book a squash court." (Sportsplex)
"Fish tracks?" (Oceanography) (Ed. Note: Fish <u>do not</u> leave tracks!)
"Traction pits?" (Mechanical Engineering)
"Vision trips?" (Comparative Religion)
"Fish and chips?" (Cafeteria)
"Chicken strips?" (Cafeteria again, its nearly lunchtime)
"Faction trash?" (Political Science)
"Fiction facts?" (Literature or Philosophy, not sure)
"Yea, I'd like to book a squash court." (Sure, when would you like it? Ok, see you then. Bye)